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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,512	04/01/2004	George L. Kerber	20-010-DIV	6471
23400	7590	08/24/2004	EXAMINER	
POSZ & BETHARDS, PLC 11250 ROGER BACON DRIVE SUITE 10 RESTON, VA 20190			BAUMEISTER, BRADLEY W	
			ART UNIT	PAPER NUMBER
			2815	

DATE MAILED: 08/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/814,512

Applicant(s)

KERBER, GEORGE L.

Examiner

B. William Baumeister

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 01 April 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 18-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 18-25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 4/4/04
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 18, 22, 24 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Imamura et al., “A submicron Nb/AlO<sub>x</sub>/Nb Josephson Junction,” (previously made of record in the IDS filed 3/24/2004). See e.g., Figs 1 and 2. The junction structure is composed of Nb/Al-AlO<sub>x</sub>/Nb (page 1586, col. 1); the junction may have a diameter less than 1 micron (e.g., page 1587, col. 2, first and second full paragraphs and page 1588 col. 1, line).

3. Claims 18 and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Lee et al., “RHEA Process for Fine-Geometry Josephson Junction Fabrication.” (previously made of record in the IDS filed 3/24/2004).

a. Lee discloses Nb/Al-AlO<sub>x</sub>/Nb Josephson junctions wherein the upper Nb layer is patterned with a circular resist mask and subsequently partially etched, followed by an anodization step for forming junction areas on the order of 0.8 um (see e.g., Fig 1 and the caption associated with FIG 5.)

b. Regarding claim 23, Lee expressly states that in the partial etch step, the Nb upper electrode may be etched from 60% up to 100%. In those circumstances wherein the etch approaches 100%, the subsequent anodization process will necessarily extend into the

underlying base Nb electrode because of the minute thickness of the Al-AlO<sub>x</sub> barrier and the amount of anodization oxidation required for sufficiently oxidizing the upper Nb electrode.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 18, 22, 24 and 25 are alternatively rejected under 35 U.S.C. 103(a) as being unpatentable over Imamura as applied to the claims above.

a. Assuming *arguendo* that the recitation in claim 18 that the junction contact has a stated diameter implies that junction must be circular in shape, and that Imamura does not sufficiently disclose that the junction may be circular as opposed to square in shape, the claims would not be anticipated.

b. Nonetheless, it was well known that the goal of forming Josephson junctions was to reduce the junction area to the greatest extent possible. It was also well known how to make resists/mask patterns that were circular in shape as opposed to square-shaped. It would have been obvious to one of ordinary skill in the art at the time of the invention to have made Imamura's anodization mask specifically circular in shape because for any given design scale, a circular shape would have a smaller area than a square shape.

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6. Claims 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Imamura as applied to claim 18 above, and further in view of Applicant's prior art admissions.

a. Imamura also discloses that the Nb base electrode is etched to the substrate to form the lower wiring. See FIGs 2b-2c and page 1587, col. 2. The last paragraph of page 1587 appears to indicate that the distance between the electrode isolation region and the junction contact is on the order of about  $(3\mu\text{m} - 0.7\mu\text{m})/2$  or 1.2 microns. Presuming 1.2  $\mu\text{m}$  is too large to read on the claim limitation "*about* 0.8  $\mu\text{m}$ ," the claim would not be anticipated.

b. Applicant acknowledges in the specification and drawings that this distance is set by existing design rules (see e.g., FIG 7B). As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to have reduced this length down to "about 0.8  $\mu\text{m}$ " because miniaturization is a well known semiconductor industry goal and Applicant acknowledges that this smaller length was within the conventional design capabilities.

7. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Imamura as applied to the claims above, and further in view of Kerber et al. '084.

a. Imamura further discloses that the junction is processed so that an oxide is coated thereover and patterned to produce an outside contact via (see e.g., FIG 2d). Imamura does not depict various conventional portions of the structure, such as how other portions of the lower Nb electrode are subsequently insulated or contacted.

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b. Kerber teaches Josephson junctions. See e.g., FIG 1 wherein the Josephson junction includes base electrode 12, tunnel barrier 14 and counter-electrode 16. An interconnect layer 24 passes through via holes formed in interlayer dielectric layer 6 to contact both of the Nb electrode layers.

c. It would have been obvious to one of ordinary skill in the art at the time of the invention to have further provided an additional via through the insulating layer covering the Imamura junction which contacts the lower, base electrode because the base electrode necessarily has to be electrically interconnected to external devices in some manner, and Kerber teaches one conventional way of making electrical interconnection to the lower electrode.

***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to B. William Baumeister whose telephone number is (571) 272-1722. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

**BRADLEY BAUMEISTER  
PRIMARY EXAMINER**



B. William Baumeister  
Primary Examiner  
Art Unit 2815

August 19, 2004